

Oral Intubation Attempts in Patients With a Laryngectomy: A Significant Safety Threat

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Abstract

It is impossible to secure the airway of a patient with “neck-only” breathing transorally or transnasally. Surgical removal of the larynx (laryngectomy) or tracheal rerouting (tracheoesophageal diversion or laryngotracheal separation) creates anatomic discontinuity. Misguided attempts at oral intubation of neck breathers may cause hypoxic brain injury or death. We present national data from the American Academy of Otolaryngology–Head and Neck Surgery, the American Head and Neck Society, and the United Kingdom’s National Reporting and Learning Service. Over half of US otolaryngologist respondents reported instances of attempted oral intubations among patients with laryngectomy, with a mortality rate of 26%. UK audits similarly revealed numerous resuscitation efforts where misunderstanding of neck breather status led to harm or death. Such data underscore the critical importance of staff education, patient engagement, effective signage, and systems-based best practices to reliably clarify neck breather status and provide necessary resources for safe patient airway management.

Keywords

difficult airway, laryngectomy, tracheostomy, tracheotomy, neck breather, intubation, patient safety, quality improvement, laryngotracheal separation, hypoxia, national health system

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Laryngectomy and other “neck-only breathing” stomas are easily mistaken for tracheostomies, and such errors can prove fatal.¹ This confusion is likely exacerbated by the 30-fold predominance of tracheostomy over laryngectomy.² Uninformed clinicians may attempt to bag mask or orally intubate patients with laryngectomy stomas, potentially causing preventable harm. While tracheostomy-related mortality is well studied,³ there are minimal data on the oral intubation of patients with a laryngectomy.

Methods

In the United States, Institutional Review Board approval was obtained from the University of Michigan (HUM00184657) to electronically distribute an anonymous survey to members of the American Academy of Otolaryngology–Head and Neck Surgery and the American Head and Neck Society. The survey was distributed via methods described in prior academy surveys^{4–8} and focused on recalled events where oral intubation had been in patients with a laryngectomy. Anonymized critical incident reporting from NHS England (National Health Service) was queried and approved by the NHS National Reporting and Learning Service. Quantitative US survey data were summarized; the UK data were qualitative only. Qualitative content analysis was conducted on free-text responses, categorizing them based on the data set (United States, United Kingdom), clinical setting, and type of error. Extreme outliers (identified by responses >3 SD from the mean) were assumed to be erroneous and were removed from further analysis.

Results

A total of 254 otolaryngologist–head and neck surgeons responded to the national survey (Supplemental Table S1, available online), with most working in academic practice (70.9%). Nearly all respondents identified their primary practice area as head and neck surgery (71.6%), general otolaryngology (21.4%), or laryngology (3.5%).

Most respondents (54%) reported ≥1 patient with a laryngectomy in whom oral intubation was attempted, reporting a median number of 2 patients (interquartile range, 1–3); 31% reported that such incidents repeatedly occurred at their institution. The majority of oral intubations were attempted by code teams (28%), anesthesiologists (26%), or emergency room physicians (20%). While the majority of these attempts at oral bagging or intubation occurred during code events, attempts were also reported during induction for scheduled surgery (21%), in the setting of stomal occlusion (15%), and for acute respiratory failure (10%). Twenty-six percent of

Table 1. Otolaryngologist–Head and Neck Surgeon Responses to a National Survey on Airway Adverse Events in Patients With a Laryngectomy: Attempted Oral Intubation.^a

Have you ever had a laryngectomy patient in which an oral intubation was attempted?	
Yes	53.7
No	46.3
Specialty of practitioner who attempted oral intubation of the laryngectomy patient	
Code team	27.7
Emergency room physician	20.3
Intensive care unit team	13.5
Anesthesiologist	26.4
General surgeon	3.4
Otolaryngologist	0.3
Other individual	8.4
Setting or indication for securing the airway	
Respiratory insufficiency	48.9
Code	58.0
Elective surgery	28.4
Patient harm associated with the oral attempt	
Reversible harm	33.7
Irreversible harm	7.9
Death	25.8

^aData from 254 American Academy of Otolaryngology–Head and Neck Surgery and American Head and Neck Society survey respondents. Values are presented as percentages.

attempts ended in patient death and 8% in serious patient harm (Table 1).

When asked to describe special provisions for patients with a laryngectomy on admission, most US otolaryngologists reported hanging a sign (78%). Far fewer reported using an identifying bracelet (4%) or verbal communication regarding the airway to involved interdisciplinary clinicians (2%). Twenty respondents to the US survey had witnessed ≥ 5 instances of oral intubation of patients with a laryngectomy (Figure 1). Responses from the US and UK data are shown in Table 2. Qualitative analysis revealed errors in bag masking the face during resuscitation, oral intubation of neck breathers, and inattention to stoma.

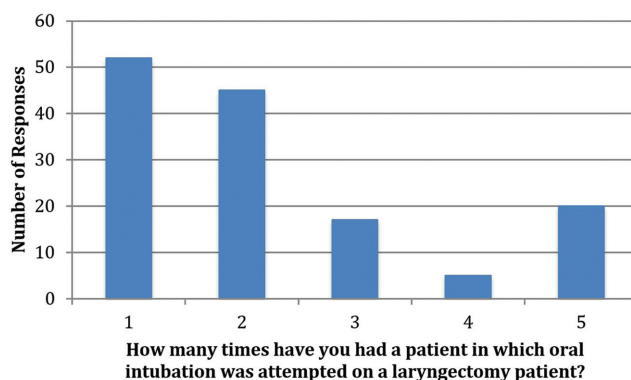


Figure 1. Frequency of reported oral intubation of patients with a laryngectomy. Data from American Academy of Otolaryngology–Head and Neck Surgery and American Head and Neck Society survey respondents.

Discussion

Prior discussion of attempted oral intubation in patients with a laryngectomy has been largely anecdotal. Itzhak Brook, a physician who coauthored this article, details his experiences in battling cancer, including receiving a total laryngectomy.^{9,10} He reflects, “As a neck breather, I am at high risk of getting inadequate therapy when forced to seek medical care in an emergency.”¹⁰ He describes his difficulty when he presented to the emergency department with dyspnea and was administered oxygen through a nasal cannula instead of his laryngectomy stoma.¹⁰

As the number of total laryngectomies decreases due to organ preservation surgery and chemoradiation,^{11,12} physicians, nurses, and allied health professionals encounter these advanced surgical airways less frequently, and associated knowledge and familiarity decline. Tokarz and colleagues’ assessment of medical students and residents found that 25% would choose to orally intubate a hypothetical patient with a laryngectomy or occlude the stoma and supplement with oral/nasal oxygen.¹³ The proportion choosing these potentially fatal options, which might be appropriate for a patient with a tracheostomy, did not improve with an increased level of clinical training, whereas a targeted educational intervention proved effective.

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Table 2. Excerpts From US Survey and UK National Reporting and Learning System.^a

Adverse events during codes	
Oral intubation attempts	
US	"I've had 3 laryngectomy patients die due to oral intubation during a code."
US	"At an outlying hospital, laryngectomy patient coded and was intubated orally. Patient died."
Oral bag masking with resuscitation	
UK	"Cardiac arrest call put out. . . . Laryngectomy patient was being ventilated from top with bag and mask by the bedside nurse. CPR commenced. Lots of thick secretions found blocking stoma. Patient death."
US	"Twice while in a code I have seen the stoma covered while the patient was bagged from above. The service thought it was air escape from the stoma and tried even harder to cover the stoma. Caregiver inserted endotracheal tube to stoma."
UK	"Patient had an arrest . . . attempts being made by ward doctors to ventilate with bag-mask ventilation. Laryngectomy 2 years previous. No documentation or nursing handover sheets. Severe harm to patient."
US	"Nurses bag ventilated a laryngectomy patient over mouth and nose; distended stomach; vomited into stoma; patient got pneumonia (recovered)."
Failure to ventilate via stoma site	
UK	"Patient with significant difficulty breathing . . . suffered asystolic arrest. Crew did not know how to ventilate a patient through the stoma site. Patient was not ventilated from time of arrest until arrival at ED."
Adverse events in course of regular hospital care	
Oral bag masking (elective induction)	
US	"I witnessed the anesthesiologist bag-masking a patient at induction. Because the patient had a TEP, he was getting CO ₂ back, so I had a hard time convincing him that there was no airway through the mouth."
Inattention to stoma care	
US	"The stoma became occluded by crusts, and the emergency room physician did not know how to handle this."
Misdirected oxygen	
UK	"Multiple teams had failed to realize this patient is a neck breather, failed to suction patient adequately, failed to review patient when sats did not improve; clear documentation of tracheal end stoma and neck breather."
Occluding stoma	
UK	"Speech language therapist observed nurse put [dressing] over laryngectomy stoma and requested nurse to remove as this could cause patient to asphyxiate."

Abbreviations: CPR, cardiopulmonary resuscitation; ED, emergency department; TEP, tracheoesophageal puncture.

^aData from American Academy of Otolaryngology–Head and Neck Surgery survey respondents and UK NHS critical incident reporting (National Health Service).

Despite significant structural differences between the United States and United Kingdom,¹⁴ we identified significant parallels across geographies in the challenges faced around management of laryngectomy cases. Airway management guidelines recommend bedside signs and airway management algorithms for patients with a tracheostomy or laryngectomy.^{15,16} These preventive measures are maximally effective if coupled with extensive education, including web-based demonstrations, workshops with simulation, and discussions centered on the newly implemented algorithms and head-of-the-bed signage (Supplemental Table S2, available online).¹⁷ A multipronged quality improvement effort by the Global Tracheostomy Collaborative found that implementing these measures significantly improved safety and patient-centered outcomes for patients with tracheostomies/

laryngectomies in the United Kingdom,^{18,19} United States, and other international sites.²⁰

Similar issues exist for children who are neck-only breathers after laryngotracheal separation, tracheoesophageal diversion, or (less commonly) laryngectomy. These airways are rare in the pediatric population; therefore, knowledge gaps are likely. It also bears mention that children or adults may be obligate neck breathers due to tracheal stenosis or other upper airway obstruction.

Conclusion

While survey data are susceptible to recall and responder biases, it should give us pause that most otolaryngologist respondents recalled at least 1 patient with a laryngectomy in whom oral intubation was attempted, with associated 26%

mortality. While some resuscitations are unsuccessful regardless of airway factors, any harm or loss of life associated with an entirely preventable lack of knowledge about the nature of a patient's airway must be addressed. These data illustrate that gaps in knowledge and misunderstanding of surgical airway anatomy are not uncommon and that adverse events may be more pervasive than commonly acknowledged.

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Author Contributions

Michael J. Brenner, drafting, analysis, critical revision, approval, accountable; **John D. Cramer**, drafting, analysis, critical revision, approval, accountable; **Brendan A. McGrath**, data acquisition, critical revision, approval, accountable; **Karthik Balakrishnan**, interpretation, critical revision, approval, accountable; **Katelyn O. Stepan**, design, interpretation, critical revision, approval, accountable; **Vinciya Pandian**, interpretation, critical revision, approval, accountable; **David W. Roberson**, design, interpretation, critical revision, approval, accountable; **Rahul K. Shah**, design, interpretation, critical revision, approval, accountable; **Amy Y. Chen**, design, data acquisition, interpretation, revision, approval, accountable; **Itzhak Brook**, interpretation, critical revision, approval, accountable; **Brian Nussenbaum**, conception and design, data acquisition, interpretation, critical revision, approval, accountable.

Disclosures

Competing interests: Michael J. Brenner, Brendan A. McGrath, Vinciya Pandian, and David W. Roberson serve on the board of directors for the Global Tracheostomy Collaborative. Michael J. Brenner is president, David W. Roberson is chair of the Board of Directors, and Vinciya Pandian is treasurer of the Global Tracheostomy Collaborative.

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Supplemental Material

Additional supporting information is available in the online version of the article.

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